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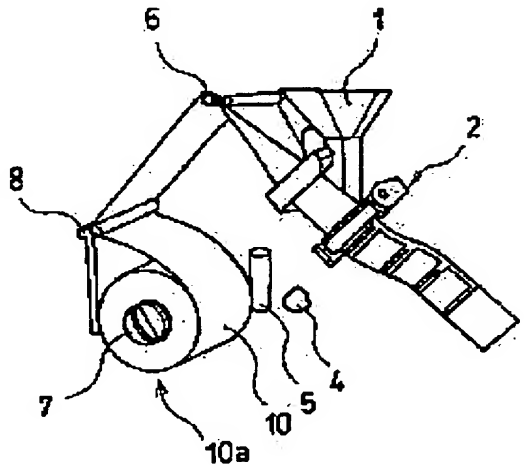
(54) MEDICINE PACKAGING APPARATUS, METHOD FOR CONTROLLING THE SAME, SUBDIVISION PACKING SHEET, AND PAPER TUBE FOR THE SUBDIVISION PACKING SHEET

(57)Abstract:
PROBLEM TO BE SOLVED: To distinguish subdivision packing sheets in a medicine packaging apparatus.
SOLUTION: The medicine packaging apparatus includes a medicine putting means 1 for putting a medicine into a subdivision packing sheet 10 and a hot welding means 2 for hot-welding and sealing the sheet 10 with the medicine put in. In this case, the subdivision packing sheet 10 has an identifier for indicating subdivision packing sheet information, and the medicine packaging apparatus is equipped with a reading means 4 for reading the identifier.



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[0020] symbol 11 (represented by a combination of small alphabet letters in Fig. 2) is printed on one side of a subdivision packing sheet 10, or on the side surface on the right in Figs. 1 and 2 and the symbol is an example of the identifier that indicates subdivision packing information such as the material or thickness of the subdivision packing sheet or temperatures appropriate for adhesion. The symbol 11 is printed using a fluorescent paint that is only visible when it emits light in response to near ultraviolet rays having a wavelength in the range from 300nm to 400nm.

[0021] As shown in Fig. 1, in the medicine packaging device according to the invention, there are for example a black light 5 that directs near ultraviolet rays upon the side surface of the subdivision packing sheet 10 on the side having the printed symbol 11 and an image sensor 4 serving as reading means for receiving light emitted from the symbol 11 irradiated with near ultraviolet rays by the black light 5 and reading the symbol 11. The black light and the image sensor are both provided near the subdivision packing sheet 10. Note that the means for irradiating near ultra violet rays may be a xenon lamp with filters or an ultraviolet LED.

[0022] The medicine packaging device is provided with a

microcomputer (not shown in Fig. 1), and the subdivision packing sheet information of subdivision packing sheets suitable for use in the medicine packaging device is stored. Data related to the symbol 11 read by the image sensor 4 is transmitted to the microcomputer. Fig. 3 is a block diagram of the connection of the microcomputer 12, and the microcomputer 12 will be described with reference to Fig. 3. Firstly, as shown in Fig. 3, the microcomputer 12 is connected with a heater 2, and an appropriate temperature for the heater 2 is stored for each of the symbols 11, i.e., for each piece of the subdivision packing information of the subdivision packing sheets 10. The temperature of the heater 2 is set in response to the symbol 11 read by the image sensor 4.

[0023] Secondly, as shown in Fig. 3, the microcomputer 12 is connected with a brake plate 8, and the paper feeding speed at which the subdivision packing sheet 10 is let out from a paper tube drum 7 and pulled into the heater 2 is preset and stored as a prescribed speed. Therefore, the pulling speed of the subdivision packing sheet 10 by the heater is substantially equal to the paper feeding speed. The microcomputer 12 detects the reading speed of the symbol 11 (which will be described) input from the image sensor 4, and controls the strength of the pressing force of the brake plate 8 to subdivision packing sheet 10 so that the paper feeding speed is said prescribed speed, and the tension of the subdivision packing sheet 10 is constant. More

specifically, in the medicine packaging device according to the invention, when the subdivision packing sheet 10 is fed as the heater 2 pulls in the subdivision packing sheet 10, therefore the remaining amount of the subdivision packing sheet 10 is reduced, and the weight imposed on the paper tube drum 7 is reduced, the tension is lowered, which tends to raise the paper feeding speed. Therefore, the paper feeding speed is controlled by controlling the level of the pressing force of the brake plate 8.

[0024] A method of packaging medicine using the medicine packaging device will be now described. A paper tube drum 7 having a subdivision packing sheet 10 wound around is attached in a prescribed position, and the subdivision packing sheet 10 is attached to the position of a roller 6. The black light 5 and the image sensor 4 are turned on using the switches on a control panel or the like provided so that the user can operate the device.

[0025] The image sensor 4 is adapted to continuously receive images and read the symbol 11 on the subdivision packing sheet 10 and the data is transmitted to the microcomputer 12. The microcomputer 12 identifies the subdivision packing sheet information represented by the symbol 11 read by the image sensor 4. If the information does not match the subdivision packing information stored in the microcomputer 12, the microcomputer 12 issues a display signal to cause the display (not shown)

provided at the control panel or the like as alarm means to display an error, and then stops the operation of the medicine packaging device.

[0026] In this way, if the symbol 11 read by the image sensor 4 matches the information stored in the microcomputer 12, a paper feeding speed is detected. More specifically, the microcomputer 12 detects the reading speed at which the symbol 11 is read, in other words, detects the timing of transmitting the data of the symbol 11 to the microcomputer 12, and determines whether or not the detected reading speed is within a prescribed speed range. The symbol 11 consisting of letters or a barcode is printed on one side surface of the subdivision packing sheet 10 in the direction of the diameter as shown in Figs. 2, 4, and 5, and the intervals between the letters or barcodes are larger on the outer circumferential side of the subdivision packing sheet 10. Here, a barcode has thick lines, thin lines, and the spaces between them arranged parallel to each other and printed in the form that can be read using a general barcode reader. The length of the intervals between the letters or barcodes differs depending on whether the printed letters and the like are on the outer circumferential side or inner circumferential side. Therefore, the length of interval part is detected, so that the speed of the subdivision packing sheet 10 can indirectly be detected. More specifically, the microcomputer 12 serves as speed detecting means for detecting the speed at which the

image sensor 4 reads the symbol 11.

[0027] Now, how the microcomputer 12 controls the medicine packaging device after it is determined whether the reading speed is a prescribed speed in response to change in the reading speed will be described. When the speed at which the symbol 11 is read is beyond the prescribed speed range, for example higher than the range, the pressing force of the brake plate 8 upon the subdivision packing sheet 10 is adjusted to be greater, so that the reading speed is within the prescribed range. If the reading speed is not beyond the range, the subdivision packing sheet 10 is let out at the present speed. When the reading speed is lower than the speed, the pressing force of the brake plate 8 is adjusted to be lower and the subdivision packing sheet 10 is let out.

[0028] The microcomputer 12 calculates the remaining amount of the subdivision packing sheet based on the reading speed and the time after the start of discharge of the subdivision packing sheet when the reading speed is beyond the prescribed speed range. A prescribed time period after the reading speed exceeds the prescribed speed range, the remaining amount of the subdivision packing sheet is displayed in several steps, and at the point when the remaining amount no longer permits the subdivision packing sheet adhesion to be carried out, an error is displayed at the display (not shown). Note that in order to detect the remaining amount, the part of the sheet corresponding to a

prescribed number of turns from the start of the roll of the subdivision packing sheet is not included in the range to provide an identifier. When the prescribed number of turns is the remaining amount (when the identifier is no longer detected), it may be confirmed that no sheet remains. Alternatively, a special identifier may be provided in the position corresponding to a prescribed number of turns, and the remaining amount may be displayed in steps once the special identifier is detected. In this way, the pressing force of the brake plate 8 is adjusted, so that slack or strain in the subdivision packing sheet 10 can be prevented, and the tension of the subdivision packing sheet 10 is kept almost constant. Instability otherwise caused by the tension of the subdivision packing sheet 10 wound around the paper tube drum 7 that causes failure such as a shift of the adhesion position, i.e., the disadvantage encountered with the conventional technique can be prevented, so that the packaging precision can be improved.

[0029] Then, when the reading speed at which the image sensor 4 reads the symbol 11 is within the prescribed speed range, medicine is introduced into the subdivision packing sheet through a hopper 1, and the subdivision packing sheet 10 is transported toward the heater 2.

[0030] The temperature of the heater 2 is set by the microcomputer 12 based on the symbol 11 read by the image sensor 4, so that the temperature is kept at a level appropriate for

the material of the subdivision packing sheet 10. The subdivision packing sheet 10 is transported to the heater 2 at controlled temperatures, and medicine is enclosed in the subdivision packing sheet 10. In this way, the temperature of the heater is controlled corresponding to the material and thickness of the subdivision packing sheet by the microcomputer 12, and therefore insufficient adhesion is not caused, in other words, the adhesion can precisely be carried out. Note that in this way, the microcomputer 12 also serves as the temperature control means for setting and controlling the temperature of the heater 2.

[0031] In this way, medicine is enclosed into packs by the medicine packaging device.

[0032] Note that according to the embodiment, the materials of the plurality of subdivision packing sheets are stored in advance in the microcomputer 12 as prescribed subdivision packing sheet information. However, the material of the subdivision packing sheet for packaging is predetermined depending on the kind of medicine in some cases. In this case, an identifier for the predetermined material is stored in the microcomputer 12, and when an identifier different from the stored identifier is read by the image sensor, an error may be displayed. At the time, the operation of the medicine packaging device may be stopped. In this way, the operation of the medicine packaging device may be controlled depending upon the kind of material

of the subdivision packing sheet, so that medicine can be packaged into the subdivision packing sheet correctly depending on the kind of medicine.

[0033] A printer to print timing to take the medicine or the like on the subdivision packing sheet may be provided at the medicine packaging device according to the embodiment, and printing settings such as a printing position may be stored for each of the symbols 11 in the microcomputer 12. In this way, the microcomputer 12 can automatically set printing conditions depending on the kind of the subdivision packing sheet. More specifically, the microcomputer 12 may serve as printing control means.

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